What is claimed:

1. A chalcogenide glass optical fiber comprising a central opening for passing light therethrough, a microstructured region disposed around said central opening, and a solid region disposed around said microstructured region for providing structural integrity to said microstructured region; said fiber has outer diameter in the approximate range of 80-1000 μm; said central opening is from about 1 μm to several hundreds of microns; and said microstructured region is 5-500 μm thick and comprising a plurality of openings arranged in courses with the openings disposed from each other a distance in the approximate range of 1-12 μm and the arrangement of said openings is such as to yield a photonic band gap in the infrared beyond about 2 μm wavelength.

2. Fiber of claim 1 wherein said fiber is circular in cross-section and elongated and said microstructured region is 20-300 μm thick and has air fill fraction of 30-99 %.

3. Fiber of claim 2 wherein said central opening is a hollow core that is circular in cross-section and has diameter of 2-200 μm, thickness of said solid region is 5-500 μm, there are at least four courses of said openings in said microstructured region around said hollow core and said openings are 1-10 μm in diameter.

4. Fiber of claim 3 wherein said openings are 1-5 μm in diameter.

5. Fiber of claim 3 wherein said microstructured region is non-circular in cross-section.

6. Fiber of claim 4 wherein said solid region is hexagonal in cross-section and said openings in said microstructured region are arranged in a pattern that produces photonic band gap.

7. Fiber of claim 6 wherein said openings in said microstructured region are arranged in a

hexagonal pattern.

8. Fiber of claim 6 wherein said microstructured region and said solid region are arranged concentrically around said hollow core.

9. Fiber of claim 8 wherein said solid region is a circumferential region around and in contact with said microstructured region and said microstructured region has air fill fraction of 40-70 %.

10. Fiber of claim 9 including an analyte in said hollow core.

11. Fiber of claim 9 including light in said hollow core, said light having pulse power density exceeding 10 GW/cm^2 or power exceeding 10 W.

12. Fabrication method for a hollow core photonic band gap optical fiber comprising the steps of:

(a) providing a mold,

(b) placing chalcogenide micro-tubes around the mold,

(c) stacking chalcogenide micro-canes around said micro-tubes,

(d) fusing the micro-tubes and the micro-canes for form a preform,

(e) removing the mold, and

(f) drawing the preform to form the hollow core photonic band gap fiber having outside diameter of 80-1000 μm, hollow core of from 1 micron to hundreds of microns, a structured region to impart photonic band gap to the fiber aroung the hollow core formed of plurality of openings arraned in at least three courses around the core with each opening being 1-12 μm and arranged in a pattern to yield a photonic band gap, and a solid region 5-500 μm thick surrounding the microstructured region to provide structural integrity to the microstructured region.

13. Method of claim 12 wherein the micro-tubes have thickness of 50-200 μm, internal diameter

of 500-2000 μm, and length of 2-100 cm; and micro-canes are solid with outside diameter of 600-2400 μm and length of 2-100 cm and the hollow core is circular 2-200 μm in diameter.

14. Method of claim 12 wherein the micro-tubes have thickness of 100-150 μm, and length of 5-20 cm; and the micro-canes are solid with outside diameter of 1000-2000 μm and length of 5-20 cm.

15. Method of claim 13 wherein the micro-tubes are disposed in a glass tube.

16. Method of claim 13 wherein said step of fusing is carried out in an inert atmosphere in the glass transition temperature.

17. Method of claim 12 wherein the chalcogenide glass in the micro-tubes and micro-canes has loss of 0.5 dB/m and lower.

18. Method of making hollow core photonic band gap optical chalcogenide fiber comprising the steps of:

(a) extruding through a plate having a central opening, a region corresponding to a structured region with a plurality of openings arranged in a periodic pattern in at least three courses around the central opening, and a solid region around the region corresponding to the structured region to form a preform, and

(b) drawing the preform to obtain the fiber .

19. Method of claim 18 including the step of cooling the drawn fiber to room temperature.

20. Method o claim 18 including the step of heating chalcogenide glass having loss of 0.5 dB/m or lower to a temperature high enough to render it flowable.